Documenta Ophthalmologica **90:** 43–52, 1995.

Conventional diagnostic ultrasound of iris lesions

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Accepted 30 November 1994

Key words: Iris tumour, Conventional diagnostic ultrasound

Abstract. Eighty patients, referred for further evaluation of prominent iris lesions, were examined with conventional B-mode ultrasound equipment combined with a simplified immersion technique. The axial resolution of this system is about 350 microns. In 20.3% of the cases, the lesion was too small for ultrasound detection. A cystic lesion was diagnosed in 26% and a solid lesion in 53.7% of the patients studied. In 33.4% of the cases, the lesions were not confined to the iris but also appeared in the ciliary body. This last result shows the diagnostic value of the conventional ultrasound examination in the evaluation apparent iris lesions.

Introduction

Iris lesions, although relatively rare, can be found in every quadrant of the iris. They can be localised or diffuse and may be found anywhere from the pupillary margin to deep into the anterior chamber angle [1–4]. They may be present with or without a corneal oedema, band keratopathy, spontaneous hyphema, pseudohypopyon, variable degrees of pigmentation, secondary glaucoma or cataract [5–9]. Histopathologically, they show a diversity in the final diagnosis [10–21] (Table 1) with the chance of a malignant tumour in up to 26% of the selected series [1].

Slit-lamp biomicroscopy, gonioscopy, photography and sometimes fluorescein angiography are used to evaluate and monitor the lesions but these

Table 1. Prominent iris lesions

primary, secondary cyst	(xantho)granuloma
naevus	melano(cytho)ma
iris eroding/displacing	CB tumours
adeno(carcino)ma	leiomyo(epithelio)ma
metastasis	rhabdomyosarcoma
haemangioma	lymphoid hyperplasia
foreign body	iris atrophy

techniques have their limitations. As a result of opaque media, poor pupillary dilatation or factors arising from the process itself it may be impossible to define the posterior margins of the lesion. The distinction between an iris lesion and the anterior extension of a ciliary body [CB] lesion cannot therefore be made.

Transillumination, also an effective tool in determining the extent and character of uveal disease, requires a skilled observer and is of limited value in amelanotic lesions, opaque media and poor pupillary dilatation. As a result of a heavily pigmented surface, blocking the transmission of light, a cystic lesion can simulate a solid one (Fig. 1). Unfortunately transillumination was not performed consistently in most of the patients and will not be evaluated here. Non-nodular diffuse thickening of the iris can be difficult to detect using slit-lamp biomicroscopy.

In a patient referral study (n=208) for iris melanomas and pseudo-melanomas [1] Shields et al. found solid lesions in 27% (88% of the melanoma cases) and cystic lesions in 31% of the cases they studied. In 42% the lesions were non-prominent (40.5% of the pseudo-melanoma cases). Since anterior segment ultrasonography can reach image areas not-accessible to direct slit-lamp observation, an axial resolution of 350 micros should be sufficient to detect most of the prominent iris-iris ciliary body lesions [24] differentiating cystic from solid tissues conventional ultrasound was thought to be of value in diagnosing and planning the intervention needed in the individual patient. The aim of the study was to discover the usefulness and reliability of conventional ultrasound as a supplementary diagnostic tool in diffentiating cystic versus solid, localised versus diffuse and iris versus iris ciliary body lesions.

The clinical use of the recently available (1993) high frequency ultrasound biomicroscope [22, 23] versus conventional diagnostic ultrasound in the assessment of anterior segment lesions will *theoretically* be compared and discussed.

Patients and methods

We reviewed retrospectively, over a 5 year period (1/88–1/93), the clinical, photographic and ultrasound records of all patients referred for further evaluation of a prominent iris lesion. The records of eighty patients were available; five patients were lost to follow-up. In six cases, a routine clinical examination unequivocally revealed an iris-eroding CB process, These patients were excluded from the study.

In the remaining 69 patients there was no sex predilection (34 women, 35 men) and a mean age of 52.2 years (range 7–90 years). At the ultrasound examination, a simplified immersion technique as described earlier [24] was

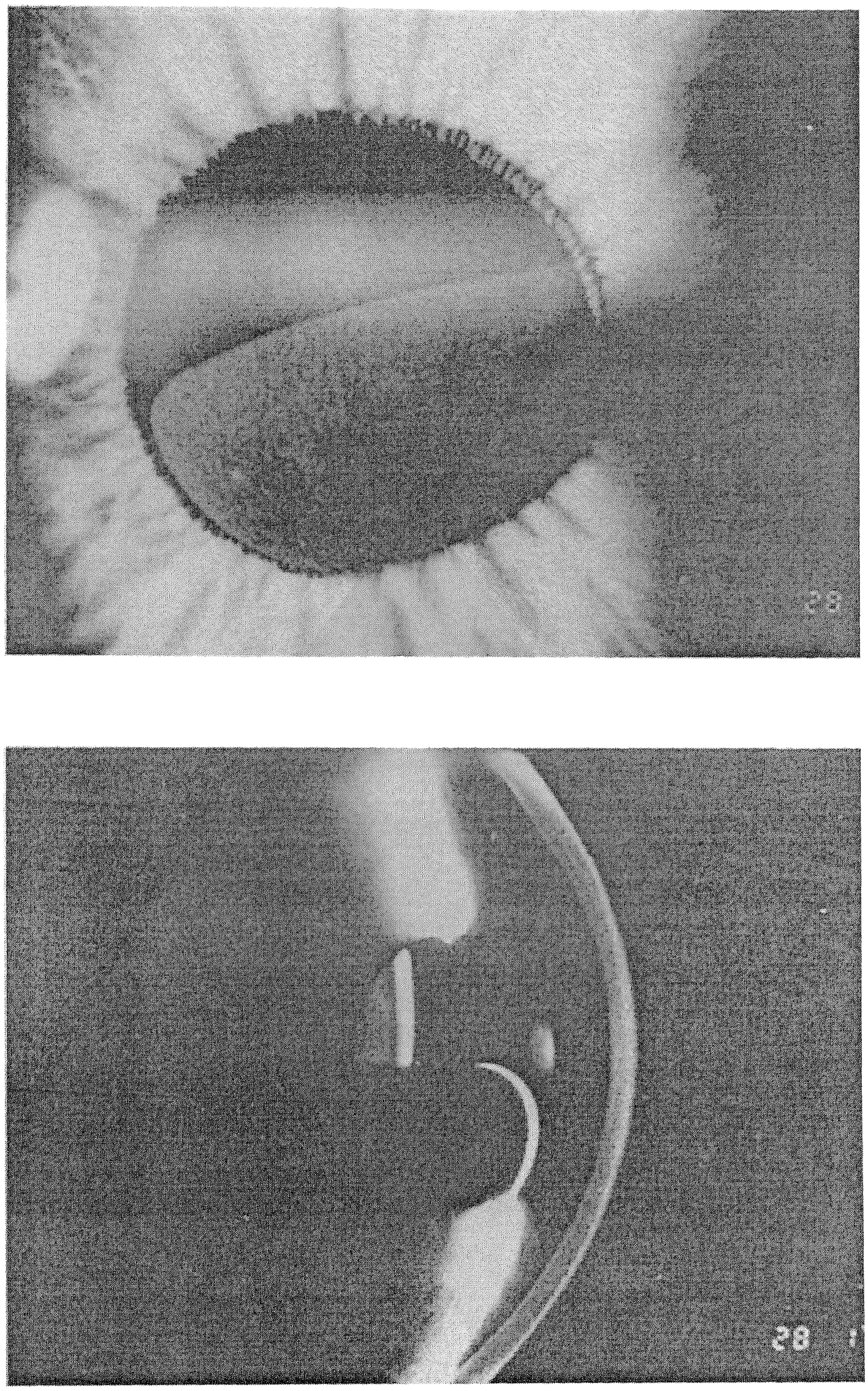

Fig. 1. Slitlamp biomicroscopic appearance of a heavily pigmented iris cyst that blocked the transmission of light.

employed and the Ophthascan 'S' (Biophysique Medicale) A/B scan system with an 8 MHz unfocused A-mode and an 10 MHz focused B-mode transducer were used. The anterior segment was scanned clockwise 360 degree, mainly

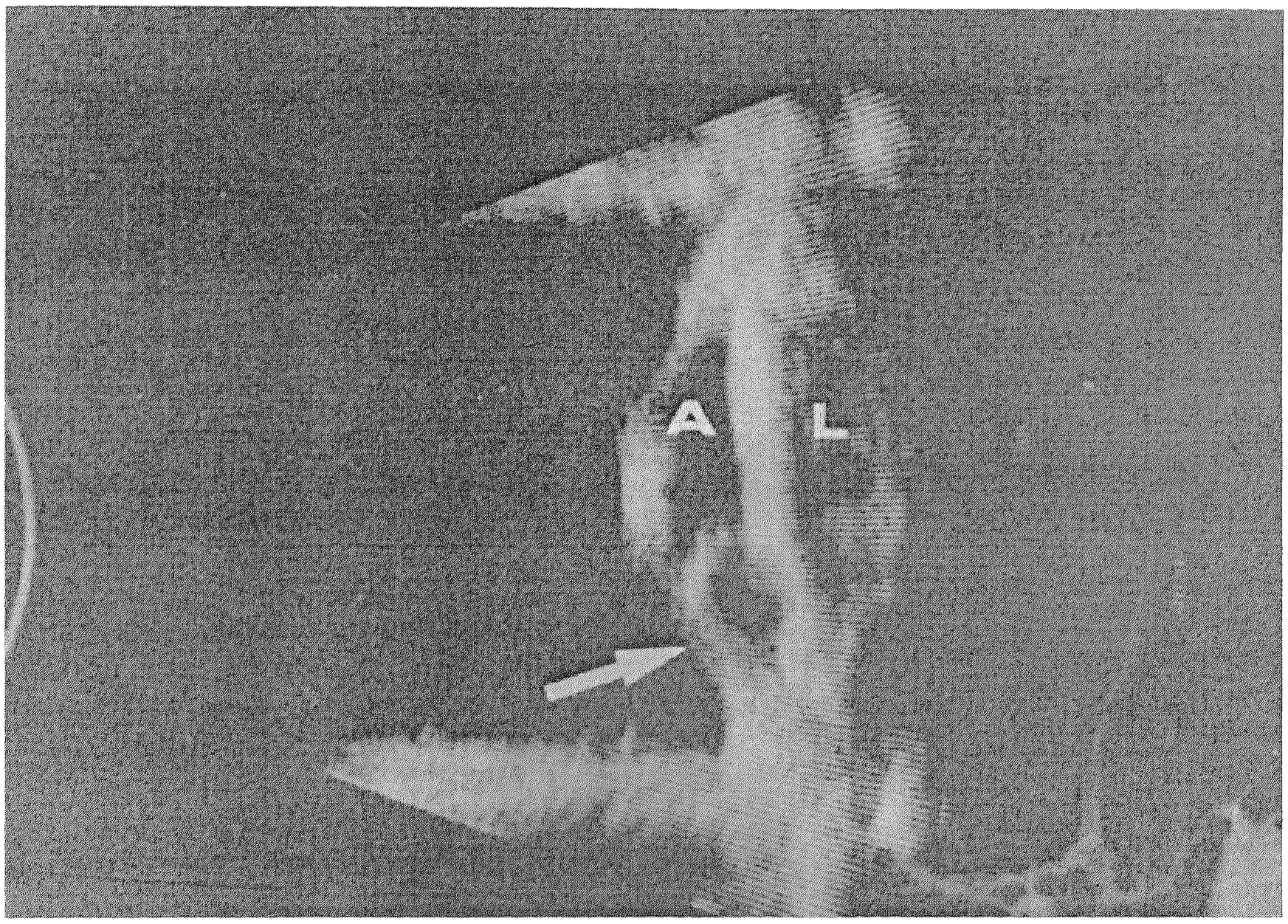

Fig. 2. B-mode echogram of an iris cyst (arrow). A= ant. chamber, L=lens. Cyst diameter 3.2 mm.

on B-mode, with special attention given to differences in thickness in the iris or the CB. To allow observation of the chamber angle and the ciliary body in the upper quadrants, the patient was asked to look slightly downward and for the lower quadrants slightly upward. The results were photographed (Polaroid filmtype 667) with and without magnification of the anterior segment B-mode picture.

The examination can be performed within a few minutes without discomfort for the patient and without the need for additional personnel.

Results

In 14 out of our 69 patients (20.3%) the lesion was too small for conventional ultrasound detection (antero-posterior diameter < 350 microns).

In the 55 patients with positive ultrasound detection, the CB was clinically not visible in one quadrant or more in 43 patients due to poor dilatation, cataract or to factors arising from the process itself. In 18 patients (26%) a round or oval circumscribed thin walled lesion with a very low to absent internal reflectivity (Fig. 2) was echographically diagnosed as a primary or

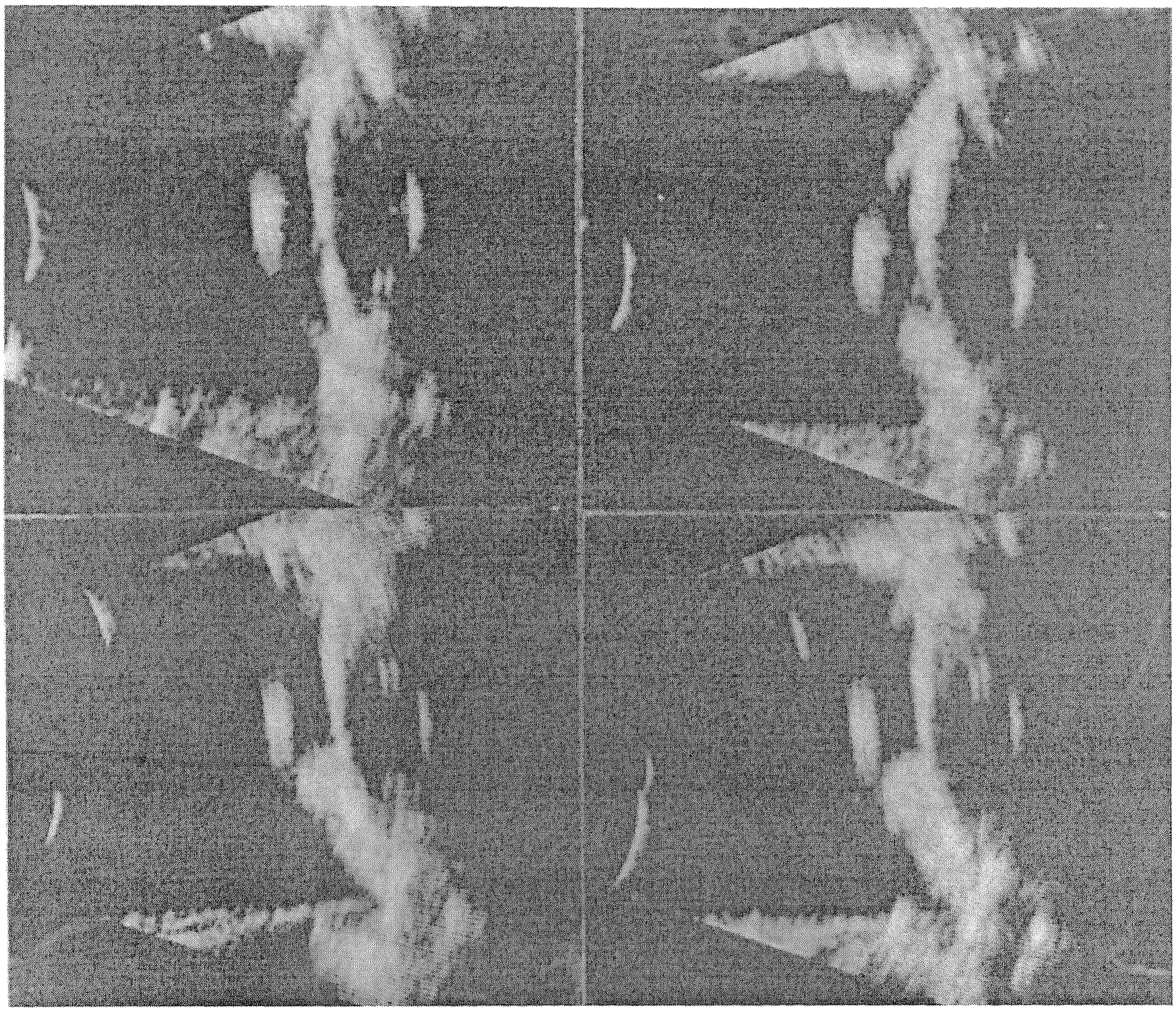

Fig. 3. B-mode sections of a solid, to the iris confined, lesion. Top left: the normal section. Mass diameter 4.6 mm.

secondary iris cyst. In 14 patients (20.3%) a mass lesion confined to the iris with regular medium to high (gray scale) reflectivity was found (Fig. 3). To our amazement in 23 patients (33.4%), a massive prominent iris lesion was imaged, having anterior (Fig. 4) or total CB involvement (Fig. 5). In six out of the eight patients having diffuse iris thickening, thickening of the CB was seen as well. The findings from the 55 patients with positive ultrasound detection are summarised in Table 2. In the two male patients (both 58 years) with an iris CB mass lesion one with pseudohypopyon) the chess x-ray showed signs indicative of lung cancer. The history of a female patient (61 years) together with a small iris mass lesion and a broad based medium to high reflective choroidal mass lesion in the same eye pointed to the diagnosis breast cancer metastasis. The histopathologic findings in 24 patients after different types of surgery (cystectomy, iridectomy, iridocyclectomy, enucleation.) are summarized in Table 3. In two patients with an echographically mass lesion confined to the iris, histopathologic examination showed CB infiltration.

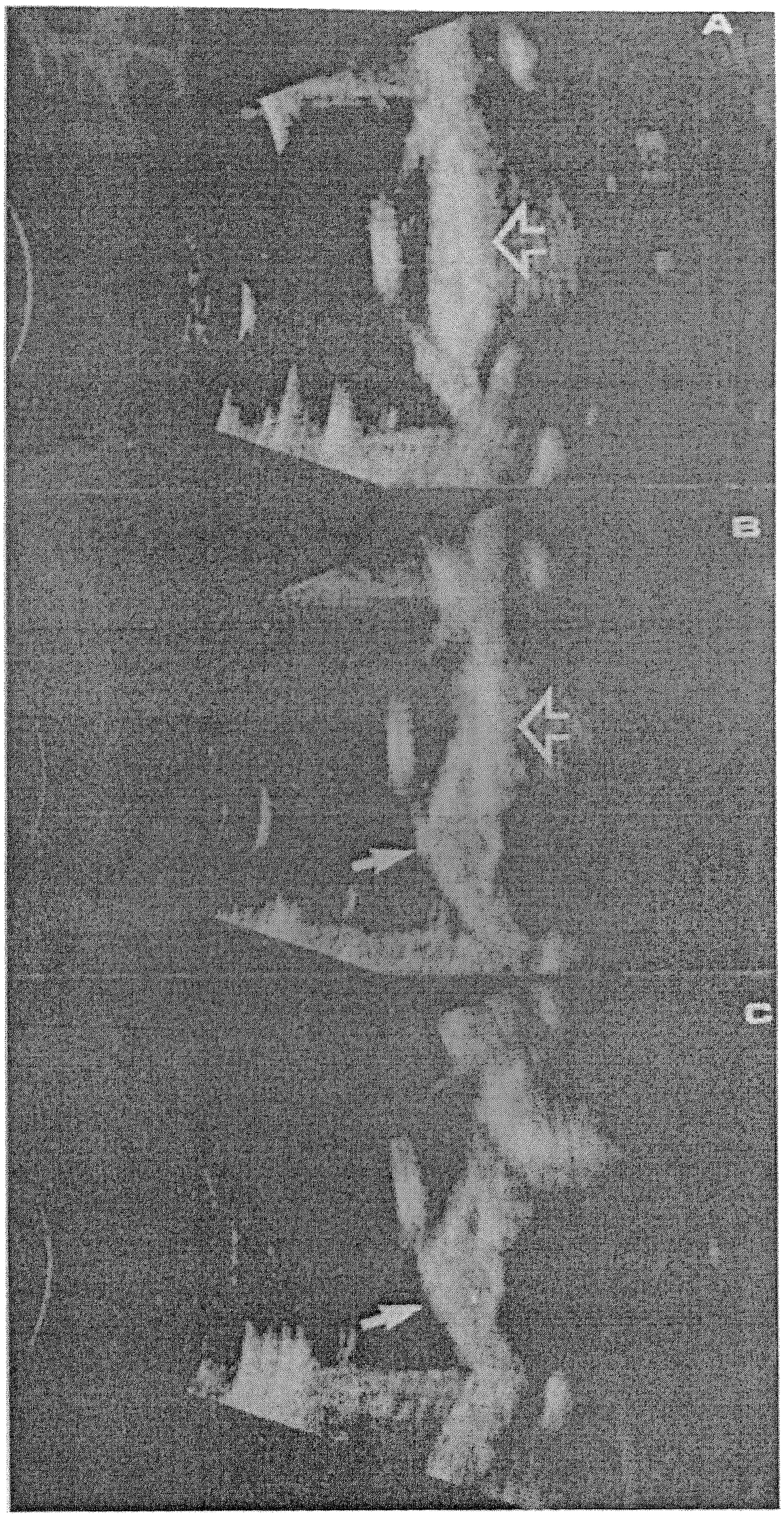

Fig. 4. A solid lesion of the iris and the anterior part of the ciliary body (white arrow) imaged recently after I.O.L. implantation (open arrow). Mass diameter 3.3 mm.

Discussion

Immersion B-scan echography of the anterior segment gives easily recognisable topographic information, especially in eyes with opaque media and of 'hidden' structures as well.

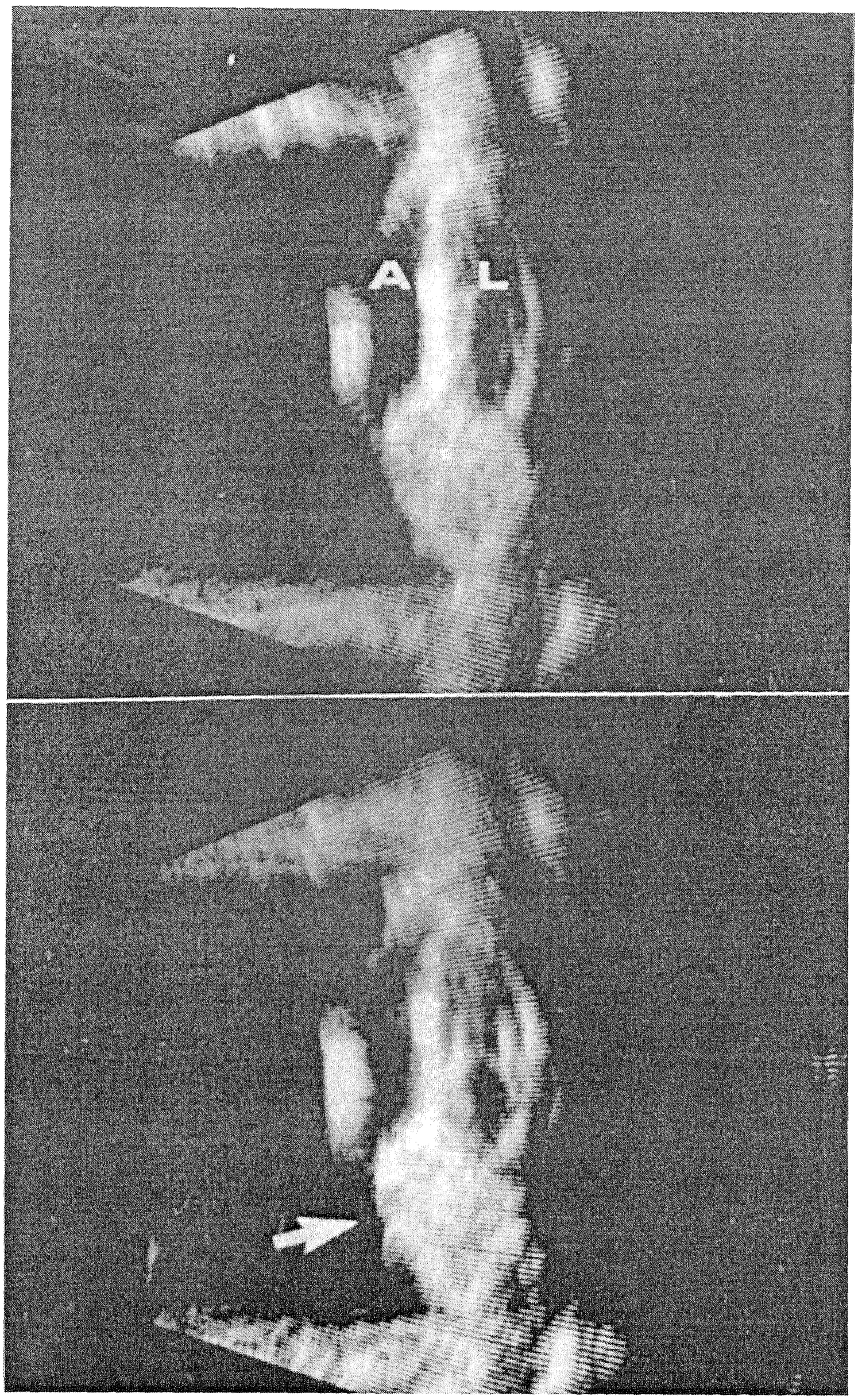

Fig. 5. An extensive iris-ciliary body mass lesion in a patient with dense nuclear cataract(arrow). A= ant. chamber, L=lens. Mass diameter 6.5 mm.

Table 2. Follow-up and treatment in 55 patients with positive ultrasound diagnosis

Treatment	Ultrasound diagnosis Cyst(n=18)	Iris mass(n=14)	CB mass(n=23)
periodic observation	11	4	6
Nd-YAG disruption	4		
cystectomy	3		
iridectomy		9[1]	
iridocyclectomy			7[1]
radiation/brachyther		1[2]	5[2]
enucleation		4[1]	7[1]

[1]Iris mass: in 4 patients after iridectomy an enucleation was performed. Iris CB mass: after iridocyclectomy 2 patients had an enucleation.
[2]Iris mass: one patient with metastasis. Iris CB mass: two patients with metastasis.

Table 3. Histopathological findings in 24 patients

Ultrasound diagnosis	Histological diagnosis Cyst	Melanoma Sp M E[1]	Leiomyoma	Adenoma
Cyst(n=3)	3			
Iris mass(n=9)		3 4 2		
Iris CB mass(n=12)		3 2 5	1	1

[1]Sp = spindle cell M = mixed cell E = epitheloid cell

A good differentiation of cystic versus mass lesions could be made resulting in a quick and, for the patient, reassuring diagnosis of primary or secondary iris cyst in 26% of patients. In the iris mass lesions, axial resolution was in two patients insufficient in detecting CB infiltration.

In all the mass lesions, the acquisition of quantitative data, aiming the one-dimensional A mode transducer without the guidance of the B-scan, to the area of interest, is difficult. The A- mode orientation in the anterior segment with strong physiological reflectors (cornea, lens-surfaces) close to the lesion of interest is limited. For the same reason the A-mode kinetic aspects of the

echogram cannot be obtained. The lack of quantitative (only B-mode gray-scale) and kinetic information makes a further differentiation of mass lesions difficult because the gross histologic architecture of a CB melanoma, adenoma and leiomyoma resemble each other. We are still unable to diagnose these tumours non-invasively, so special care to avoid unnecessary enucleation should be taken.

In 33.4% of the cases the presumptive diagnosis of iris melanoma was revised to iris melanoma with CB or CB melanoma with iris involvement, a dangerous situation that should be detected as early as possible to initiate adequate, mostly surgical, treatment. In this group of patients epitheloid cell melanomas were frequently found (Table 3).

It is a general physical rule that the higher the frequency of the ultrasound is, the greater the axial and lateral resolution will be, with, however, decreased tissue penetration. At this concept Pavlin and coworkers [22] developed the ultrasound biomicroscope (freq. 50–100 MHz), capable of producing impressive images of the anterior segment at microscopic resolution (50–60 microns). The axial resolution achieved over routine ultrasound improves in the high frequency technique by a factor of 5 to 6. The sound penetration at this frequency is limited to only 4 mm. The patients with anterior segment tumours examined with this apparatus by Pavlin [23] had mostly an antero-posterior diameter of the lesion much larger (1608, 1200, 740 microns) than the resolution level of the conventional ultrasound equipment. In the larger tumours of the CB the posterior borders of the process could not be imaged due to limited sound penetration while the precise histologic boundary of the tumour and the tumor cell-type were still below the resolution of the ultrasound biomicroscope, despite the high frequency. This limitation suggests that conventional ultrasound equipment still has a useful place in the diagnosis and management of anterior and posterior segment lesions.

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